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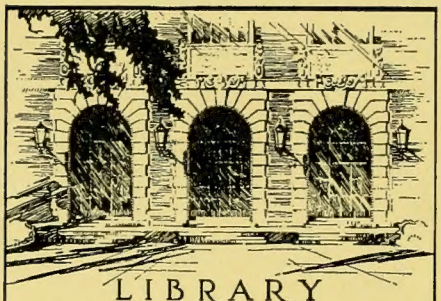

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A NEW TECHNIQUE IN CONTROL OF THE HOUSE FLY

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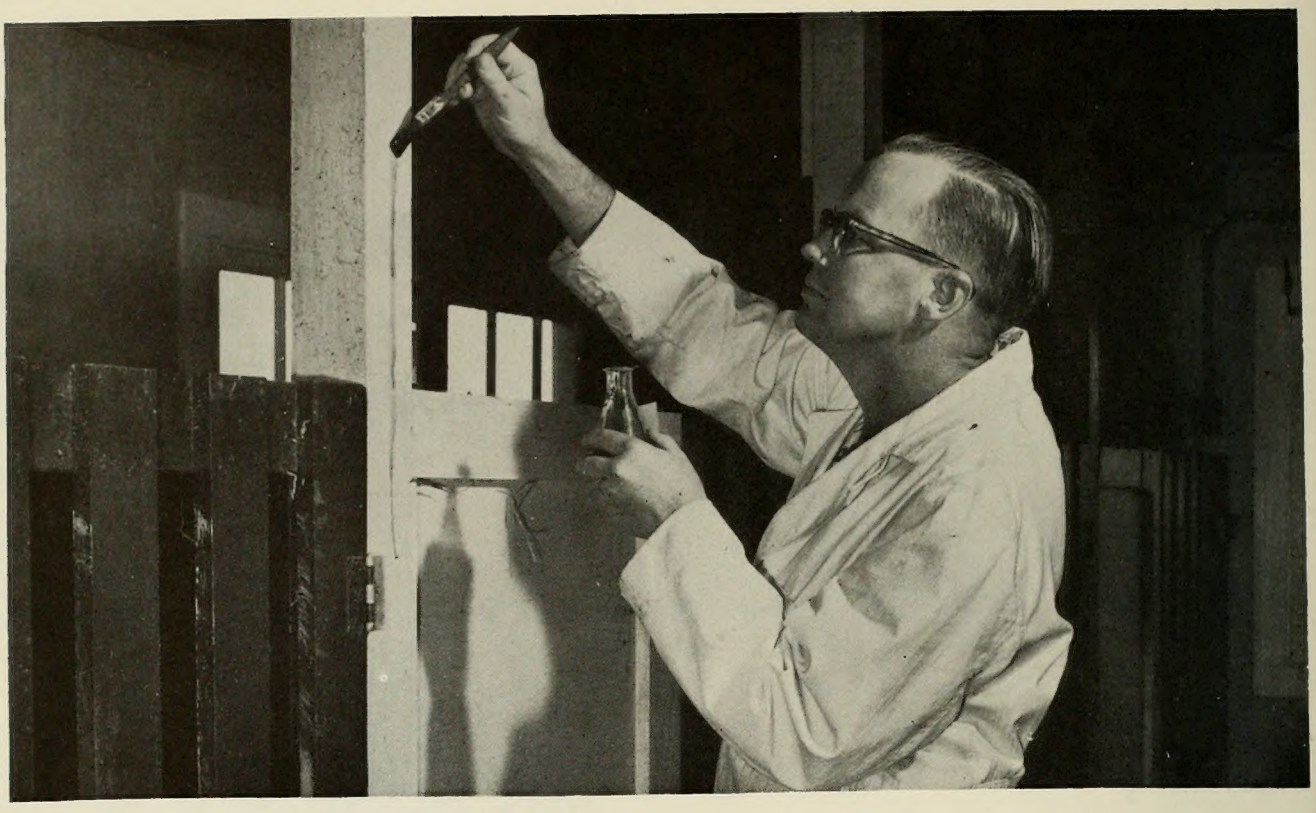

Fig. 1.--Applying bait consisting of Karo syrup and Bayer L 13/59 to post in calf barn. If bait is applied in places where house flies congregate, only a small amount is needed.

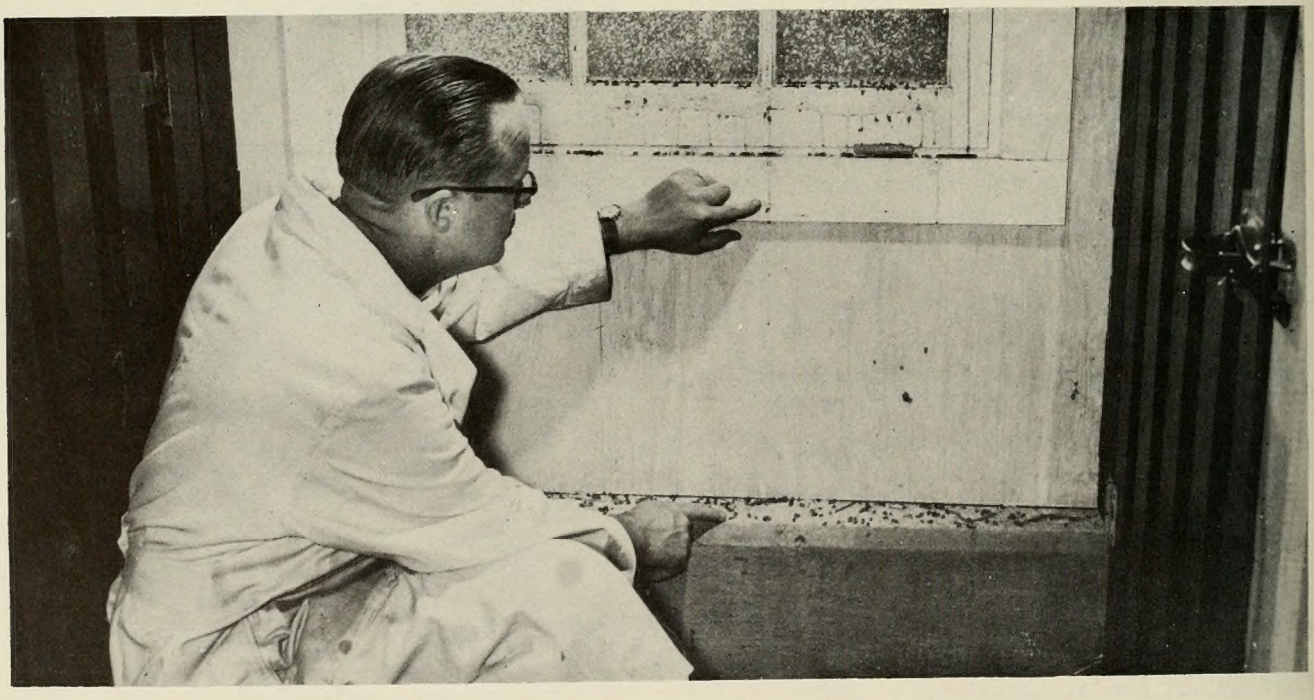

Fig. 2.--Hardened bait ($1\frac{1}{2}$ grams Bayer L 13/59 in 1 pint Karo syrup) applied to window frame in barn. The bait continued to kill house flies for more than 2 months after it was applied.

A NEW TECHNIQUE IN CONTROL OF THE HOUSE FLY

Willis N. Bruce, Associate Entomologist, Natural History Survey Division

Since about 1950, an increasing degree of tolerance to residual sprays has been noted in populations of the house fly, Musca domestica Linnaeus, in most parts of the United States.

A public that placed too much dependence on residual insecticides and too little on sanitation as a means of house fly control has been forced to turn from residuals to chemicals of only temporary effectiveness.

In the past three years, space sprays containing pyrethrins and baits containing TEPP (tetraethylpyrophosphate) have gained some popularity. None has given lasting relief except when applied at intervals of a few hours or a few days. TEPP possesses the disadvantage of considerable hazard to the health of animals it is designed to protect and of even greater hazard to persons applying it.

MATERIALS AND METHODS

In April, 1953, the author began a series of laboratory tests with a dialkylphosphate known as Bayer L 13/59. A bait consisting of $1\frac{1}{2}$ grams of Bayer L 13/59, 1 pound of granular sugar, and 3 gallons of water gave a high degree of control of house fly populations for 2 or 3 days.

The effective period of the bait, which was made in accordance with directions furnished by the manufacturer of Bayer L 13/59, was little better than that for TEPP and therefore held small possibility of greater usefulness to farmers and other potential users of fly baits.

In mid-June, 1953, the author began another series of tests, tables 1 and 2, with a bait consisting of $1\frac{1}{2}$ grams of Bayer L 13/59, dissolved in about 4 ounces of water, and thoroughly mixed into 1 pint of dark Karo syrup.

This bait was applied in small quantities with a paint brush, fig. 1, to relatively smooth surfaces where flies tended to congregate. Results of laboratory tests are given in table 1 and of field tests in table 2.

In barns, the bait was applied to posts, fig. 1, window frames, fig. 2, and partitions, fig. 3, and to strings or wires hanging from ceilings. In and around other premises, it was applied to window frames, edges of window screens and screen doors, on the outsides of garbage cans, and on pieces of paper or cardboard placed where flies were seen to alight. Only a small amount of the bait was applied in any one building, table 2.

RESULTS

Under field conditions the syrup bait consisting of 1 pint of Karo syrup and 1½ grams of Bayer L 13/59 dried and lost its tackiness in about 4 hours. It gradually hardened until it was tough and plastic.

Flies were attracted to the bait as soon as it was applied and continued to be attracted to it after it had hardened, even when it was covered with dust and dead flies.

After locating the bait, flies showed no disposition to leave, but fed avidly, dissolving the hardened Karo with their salivary secretions. They showed distress symptoms in 1 to 3 minutes after beginning ingestion of the bait, and immobility or at least complete loss of co-ordination in 5 to 15 minutes. No flies that fed sufficiently to exhibit distress symptoms were known to recover.

Not only did the hardened bait continue to attract flies throughout the summer of 1953; it continued to kill them. Applications of hardened Karo containing Bayer L 13/59 were apparently as lethal to house flies in October as in June, when they were made.

Eight ounces of bait applied as thin dribbles in about two dozen places on partitions and posts were sufficient to give 94 per cent control in a 20- by 50-foot calf barn in which fly production was going on in the litter of stalls. Less than a quarter ounce applied in thin strips in about a dozen places along window ledges and partitions gave better than 93 per cent control in a store, 20 by 40 feet, that sold dairy products and that was screened but that had many customers passing in and out each day; observations indicated that a larger amount of bait applied in a greater number of places would have given better control.

Generally, hardened bait gave the best house fly control on those premises having a high level of sanitation and effective screening, table 2. In the Grade A dairy barns, which had a high standard of sanitation and fly exclusion by windows and screens, the hardened bait gave control that ranged between 90 and 95 per cent. In most dairy and feeder barns that were unscreened, the bait was ineffective because, although it killed many flies, other flies quickly moved in to replace most of those that had been destroyed. The sheep barn, in which 92.5 per cent control was obtained, was isolated from other sources of infestation and had few or no fly-breeding areas on or near the premises. In the baited south part of an H-shaped calf barn, not listed in table 2, the house fly population was noticeably reduced but not adequately controlled, figs. 4 and 5, because flies moved in from the unbaited north part of the barn and from outdoors.

The reason for the unexpectedly strong residual properties of Bayer L 13/59 when incorporated in Karo syrup was not investigated. Possibly

Fig. 3.--Narrow strip of hardened bait (1½ grams Bayer L 13/59 in 1 pint Karo syrup) in south part of H-shaped calf barn. Two months after being applied, the bait was still effective. House flies on floor represent the kill from this strip in less than a day. North part of H-shaped barn was unbaited, and flies breeding there had free access to south part.

Table 1.--Results of laboratory tests with hardened bait consisting of 1½ grams Bayer L 13/59 in 1 pint of dark Karo syrup, June, 1953. In each test 2,000 house flies were released in a 20- by 18- by 9½-foot room in which 20 milliliters of the bait had been placed in 10 small bait containers grouped within an area of 3 square feet.

Test No.	Per Cent of Fly Population (2,000 Flies) Killed in 1 Hour	Number of Hours Required for 100 Per Cent Kill
1	92	12
2	90	20
3	94	8

Table 2.--Results of treatment with hardened bait, consisting of 1½ grams Bayer L 13/59 in 1 pint Karo syrup, used against the house fly on Illinois premises, summer, 1953.

Premises	Square Feet of Floor Space	Per Cent Control Obtained With One Application*	Milliliters of Bait Used	Period of Observation
Calf barn	1,000	94.0	260	21 weeks
Fly Lab. office	500	93.0	50	26 weeks
Dairy and feeder barn, no sanitation, windows and doors open, no screening	5,000	72.0-87.0	1,400	3 weeks
Sheep barn	4,000	92.5	450	15 weeks
Dairy store	800	93.5	5	8 weeks
U. of I. office	270	95.0	15	12 weeks
Grade A dairy barn 1	2,400	90.0	450	16 weeks
Grade A dairy barn 2	3,000	93.0	450	16 weeks
Grade A dairy barn 3	1,750	92.0	450	16 weeks
Grade A dairy barn 4	2,400	94.0	450	16 weeks
Grade A dairy barn 5	2,500**	95.0	450	16 weeks
Grade A dairy barn 6	2,500**	94.0	450	16 weeks
Grade A dairy barn 7	2,500**	95.0	450	16 weeks
Grade A dairy barn 8	4,000	92.0	450	25 weeks
Dairy round barn, open on all sides, very poor sanitation	4,400	60.0-75.0	1,350	2 weeks
Experimental animal rooms, Animal Science Building	(1,000	99.0	100	12 days
	(2,000	95.0	150	12 days

* The per cent of control was derived by comparing the average fly population observed before treatment with the population observed at intervals after treatment. The apparent lack of control in two cases (less than 90 per cent) was not the fault of the technique but the result of lack of both sanitation and screening.

**Approximate.

Fig. 4.--Calf in untreated north part of H-shaped barn mentioned under fig. 3. House flies were numerous on calf and about pen.

Fig. 5.--Calf in south part of H-shaped barn mentioned under fig. 3. Although house flies had free access from untreated north part, on this calf they were only about one-tenth as numerous as on calf pictured in fig. 4.

a chemical change takes place in the Bayer compound, or, as seems more likely, the Karo merely "seals" the compound and allows it to retain its lethal properties.

CONCLUSIONS

Although the bait prepared from Karo syrup and Bayer L 13/59 gave unexpectedly good control of house flies over unexpectedly long periods of time, the hardened bait resulting from an undiluted syrup and a toxic substance should be regarded as the basis of only one of several techniques necessary to bring house fly populations to a desirably low level. The last fly or half dozen flies in a room are the hardest to kill with baits. Space sprays and repellents should be used in certain situations. Most important, sanitation, the elimination of places where flies breed, should be continued and intensified.

The Karo syrup with Bayer L 13/59, which proved relatively attractive to house flies in laboratory and field tests, might be improved by the addition of an attractant. Also, other syrups might prove more attractive and other poisons more effective against house flies without presenting any greater hazard to human beings.

As of the date of this publication, the use of Bayer L 13/59 in a fly bait has not been passed upon by either the United States Food and Drug Administration or the Production and Marketing Administration. However, judged by the data now at hand, the toxicity of the bait recommended ($1\frac{1}{2}$ grams of Bayer L 13/59 in 1 pint of Karo syrup) is such that 20 pints of it would approach the median lethal dose for a human being weighing 150 pounds. One pint of this bait (about 475 milliliters), sufficient for most premises, should present no toxicological hazards.

Although the bait may be objectionable to some housewives who place an inordinately high value on neatness, it can with a small amount of ingenuity and artistic skill be so applied, even in homes, as to attract house flies without repelling finicky guests or members of the household. It is easily removed from wood or other smooth surfaces with a damp cloth, but, if objections are made to its being applied directly to parts of the house, it can be daubed on small pieces of paper or cardboard placed where flies alight.

The hardened bait described above appears to offer a new and effective technique contributing to control of the house fly.